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Building National and International Action

The survey of developments around the world in the previous chapter showed that, while there is a great deal of action to cut emissions and adapt to the effects of climate change, existing actions and commitments fall well short of what is needed for a reasonable chance of holding to 2°C. It also argued that national actions are in large measure driven by domestic pressures and factors, but at the same time that the international sense of direction and the state of the global economy can exert strong influences on domestic pressures and opportunities. Global developments can, for example, shape the availability of technical options (e.g., clean energy technologies); relative prices (e.g., of different energy sources and technologies); macroeconomic conditions and perceived prospects; the perceptions of politicians, citizens, and investors about what others are doing, and their future expectations about risks and opportunities (including the aggregate amounts of climate action expected, and hence climate risks and market opportunities for low-carbon goods and services); and the development of norms and standards of behavior. Global developments, in other words, affect the incentives and perceptions, both positive and negative, that agents—national, city, business, and so on—face when making decisions regarding climate change.

At the same time, the strength of national, local, and business decisions and the examples they demonstrate can have a powerful influence on progress toward international agreement. There is a potentially constructive interplay between international cooperation and action within countries (national, city, business, etc.). In this sense there is mutual reinforcement between international action and action within countries.

If we are to build national and international action, we must understand how the mutual support between them can be fostered and strengthened. We must think about ideas, mechanisms, and processes that bring people and nations together through recognition of common interests and opportunities in a constructive and dynamic way, rather than those which are likely to separate and divide. That is the purpose of this chapter.

In section 8.1 we examine frameworks that can shape the interplay between national and international action. Building common understanding and cooperation requires foundations and ways of working. In section 8.2 we examine the sharing of goals, the raising of ambition, and the building of credibility, and in section 8.3 how trust and confidence can grow. Collaboration on finance, technology, and innovation is the subject of section 8.4. In section 8.5 we comment briefly on the upcoming COP in Paris in the light of the preceding analysis, and on leadership from big countries in section 8.6.

8.1 Toward a better framework for international climate action

International climate change institutions and negotiations are an important factor influencing what countries and nonstate actors decide to do about climate change. Yet some argue that international cooperation is impossible and that action at the country level will be enough to manage climate change. Such arguments have gained some traction since COP 15 in Copenhagen in 2009. And it is true, as the Global Commission on the Economy and Climate showed, that much of what needs to be done to cut emissions comes from investments in transforming cities, land use, and energy that are in countries' own interests (see section 2.10).¹

However, to argue for national action without international cooperation is to misunderstand the economics, the science, and the politics. It is a misunderstanding of the economics in that investment will be hampered by a lack of confidence in where the world is going. It is a misunderstanding of the science which tells us that delay through insufficient scale of overall action at the global level is dangerous. It is a misunderstanding of the politics, where it is clear that domestic action is enhanced by progress on the international front. It is all too easy to say that we

should do little because others are doing little (the latter statement often made in ignorance of what others are actually doing).

At the same time, international cooperation is encouraged by progress at the firm, city, and country levels. If a country, a city, or a firm sees others moving now to adopt low-carbon strategies and policies, and there is a possibility of international agreement in the future, it may see its own actions as part of a bigger picture, with potential new growth markets for the ideas and technologies of those who move early and potential obstacles for those who “stay dirty.” The early movers may thus encourage their national decision-makers and negotiators to seek an international agreement. And the decision-makers themselves may be more willing to collaborate internationally, with or without the pressure, if they can see the examples of the benefits of and commitment to climate action in their own country. Thus international cooperation and intra-country action can be complementary; they can reinforce each other and can bring countries closer together, spurring greater action.

However, recognizing the importance of international cooperation does not tell us what *kind* of international cooperation is best suited to dealing with climate change; it does not tell us *how* best to connect international cooperation to action within countries. Thus we should focus on how to get national and international initiatives to support each other in a way that allows effective action on the scale and in the time required.² Answering these questions requires an understanding of the science, economics, and ethics of climate change; an appreciation of the roles, responsibilities, and politics of different levels of governance, from the local to the international, at which actions can be taken, and the merits and difficulties of action at each of these levels; and an understanding of the strengths and weaknesses of different frameworks for international climate action and governance, especially with regard to scaling up mitigation action.

As chapter 7 showed, generating the political will to act at the international level has proved difficult. Moreover, from the perspectives of theories and principles of cooperation and international relations, there are inherent difficulties with and limitations of international climate change agreements that must be considered and understood.³ These include the large number of parties involved; integration and consistency with the nonclimate goals of different countries; problems with setting

targets under uncertainty around temperature rise and other outcomes; composition of initiatives and action between countries, for example on emission reductions and R&D, in light of differing conceptions of what is equitable, and of uncertainty over future developments in technologies and relative prices; difficulties with noncompliance and enforcement at the international level; and incorporating other important aspects such as adaptation, protection of oceans, biodiversity, and so on.

There can be big differences in the perceived costs, benefits, and co-benefits of climate action (which often stem from differences in the political and economic goals and structures of the key players), which to a large extent determine the negotiating positions. There are often also difficulties in taking account of regional and local action (i.e., in cities around the world, states within federations such as the US, and so on). A failure to understand what others are doing, and a presumption that it is very little, reinforced by expectations that international cooperation will be weak has generally hindered progress.

Applications of ideas from traditional game theory have often been pessimistic in stressing free-riding: countries avoid taking action themselves and benefit from (or free-ride on) the actions of others. As we have seen, however, there is in fact much action in the absence of a collective international agreement. This can partly be explained by the fact that, as I have emphasized throughout this book, countries are responding, and will need to respond more strongly, to the many important structural changes and challenges in cities, energy systems, and land use. Strong investments in these areas to reduce waste, pollution, congestion, energy insecurity, and damage to ecosystems will bring strong benefits even without counting reduced emissions. And by pursuing such policies and investments, much of what is necessary for reducing emissions in the next two decades or so can be achieved (see section 2.10 on the findings of the Global Commission on the Economy and Climate). Moreover, as governments increasingly understand both that many of these investments are in their countries' self-interest (even without considering climate) and that the risks of collective inaction on climate are immense, many are acting responsibly and showing leadership (see the examples and discussion in chapter 7). The standard, simplistic and pessimistic version of game theory, while not irrelevant, therefore appears to be inconsistent with the political reality and real-world experience.

Economists may thus need to go beyond the narrow assumptions concerning behavior in that approach.

What is needed is an international climate framework that can cope with the uncertainties in climate outcomes and impacts, and at the same time foster a shared understanding not only of the risks from failing to collaborate nationally and internationally, but also of the potential for dynamic learning and for Schumpeterian waves of discovery and innovation. Together with the co-benefits stemming from less-polluted and safer ways of living, energy security, and biodiversity, these dynamic returns to investment and innovation make much of the investments and actions needed to tackle climate change positive-sum, involving large-scale benefits that extend well beyond the mitigation of climate risks. Strong investment and innovation are likely, as I have discussed, to drive costs down and open up new opportunities for low-carbon growth and development. Recent history has demonstrated that society often underestimates the speed of cost reductions (a 2005 study forecast that costs of solar energy would come down to \$1/W only in 2023 or later; as we saw in chapter 2, they are already below \$1/W in 2014).

The remainder of this chapter sketches the key elements of an international climate framework for action appropriate to the climate challenges as described in this book. These elements focus on mitigation, and particularly mitigation in relation to energy, though this should not be to the exclusion of mechanisms to tackle adaptation, loss and damage, and mitigation in other areas such as land use and forestry. Rather, it should be seen as an example of a more flexible and less formal approach to shaping international agreement. It does indeed remain very important to establish a strong international agreement. The argument here concerns how to build a stronger agreement than one that is likely to arise from a more rigid and formal approach; an agreement based on principles for increasing the necessary scale of change, a recognition of mutual interest particularly around combining growth and climate responsibility, and trust on the basis of examples, collaboration, transparency, and track records.

This is an area where my own thoughts, and those of many others, have changed since the period before COP 15 in Copenhagen in 2009. Experience has taught us that real progress can be made without a formal international agreement.⁴ At the same time, it has shown us that the sum

of that progress across the world is far too slow. Further, experience with the Kyoto approach has raised doubts about the potential strength of enforcement of international sanctions. Finally, we have also learned much more about the potential dynamic and economic advantages of strong action in terms of self-interest at the national level. These experiences motivate the ideas that follow.

8.2 Sharing goals, raising ambition, and building credibility⁵

8.2.1 Sharing goals

This whole story is about managing overall emissions to achieve radical reductions in climate risks. It is therefore important that global efforts on climate change be guided by a shared understanding of the long-term goals toward which we, as a world, are orienting our current efforts. One of the main achievements of the Cancún COP 16 in 2010 was the unanimous agreement by governments on the 2°C goal. The Cancún decision text records countries' recognition

that deep cuts in global greenhouse gas emissions are required ... so as to hold the increase in global average temperature below 2°C above pre-industrial levels, and that Parties should take urgent action to meet this long-term goal, consistent with science and on the basis of equity.⁶

The Cancún decision, along with the principles of the UNFCCC, also recognizes the historical inequities associated with the high historical emissions in the rich world. It recognizes, too, the importance of securing the 2°C goal in a way that is consistent with growth, development, and poverty reduction. As I shall argue in the next chapter, issues of equity are central to the discussion of climate change mitigation (as they are to adaptation and “loss and damage”).

As emphasized in chapter 1, staying below 2°C is not amenable to precise planning: different mitigation pathways imply different *probabilities* of achieving that goal. Throughout the book I have mostly assumed a goal of staying below 2°C with a 50% probability, and have argued that, for most plausible paths achieving this aim, this would necessitate emissions being below 20 billion tonnes of CO₂e by 2050 and continuing to fall. The mitigation task can usefully be framed as one of phasing out emissions by some point in the second half of this century. As OECD Director-General Angel Gurría has put it, “governments need to start

taking action now to put us on a pathway to achieve zero net greenhouse emissions globally in the second half of this century”⁷—a call echoed by UNFCCC Executive Secretary Christiana Figueres⁸ and in the New Climate Economy report.⁹ Given that it will prove more difficult in some sectors than in others to drive emissions to zero, some will have to go to zero or negative substantially before the end of the century. As the New Climate Economy report emphasized, what we do in the next two decades will strongly shape what we can do for the rest of this century. If we act in an effective and committed way, we could make discoveries that could lead us to zero emissions much earlier than if we prevaricate and delay.

Framing the shared goal in this way leads into a discussion about the phasing out of emissions from different sectors of the global economy. In some sectors, such as power supply, passenger transport, buildings, and land use change, the methods for phasing out emissions (technologies, process changes, social changes) are already known, fairly well understood, and technically feasible. In others, such as industry and agriculture, a number of possibilities are recognized and promising, but strong innovation will be needed to achieve a full phase-out.

Countries should therefore think strategically about the sequencing of their plans for phasing out emissions. The facts that energy emissions from power and land transport make up the bulk of global GHG emissions and that phasing them out is already technically feasible suggest strongly that these sectors should be the first to see emissions reduced to zero. This was the argument of Angel Gurría when he called for the goal of eliminating fossil fuel energy emissions by the second half of the century as the central objective on the pathway to net zero greenhouse gas emissions.¹⁰ The UK Committee on Climate Change, a leading authority on the technicalities of sectoral decarbonization, has taken a similar approach. The committee’s mandate is to advise the UK government on how to meet the UK’s target of an 80% emissions reduction by 2050 by recommending 5-yearly “carbon budgets” with detailed decarbonization plans and targets for individual sectors of the UK economy. Its recommendations have emphasized measures to achieve especially deep reductions in the power supply sector, along with large reductions in the buildings and transport sector, by 2030.¹¹

Within energy, decarbonizing the electricity sector has been a particular priority of the Committee on Climate Change and is “at the core

of the low-carbon transition” generally.¹² This is for several reasons: first, power generation is a major source of GHG emissions in most countries; second, low-carbon power generation is well understood and feasible, with many options available (and, as described in chapter 2 in this book, the costs of some renewables are coming down very rapidly, and others have high potential for cost reductions); and third, decarbonized electricity has an important role to play in reducing emissions in other sectors, especially transport (through battery-powered electric vehicles and rail), residential heating (through, for example, ground source and air source heat pumps), and potentially some parts of industry.¹³

As the UK experience is demonstrating, it is reasonable to look to developed countries to decarbonize their electricity sectors well before the midpoint of this century—by perhaps 2030 or 2040. The timescale for developing countries to decarbonize electricity would be somewhat slower. The investments and innovation by developed countries would most likely, collectively, bring down the costs of technology options greatly (just as investments by a number of European countries kick-started the rapid price declines in wind and solar photovoltaics, which were then accelerated through large-scale manufacturing in China). Promoting the flow of finance, technology, and know-how into developing countries should be a major priority of developed countries. And we may increasingly find technological and other advances flowing the other way and emerging through collaboration. If developed countries take the lead in decarbonizing the electricity sector, financing the innovation required to bring down clean energy prices (from which all countries benefit), and they collaborate with developing countries in the process, then the conditions for similarly deep decarbonization efforts by developing countries will be much more favorable.

Establishing a goal for the decarbonization of the electricity sector across many countries would send a clear signal to investors that the international community is moving strongly to phase out emissions across the economy as a whole, particularly if combined with explicit objectives for other sectors. Setting such a clear, concrete direction of travel at the sectoral level is an important way in which international understanding and collaboration can help catalyze the innovation and investment necessary for radical domestic transformations.

8.2.2 Raising ambition and building credibility

Much has been made—by governments, experts, and environmental NGOs, in particular—of the distinction between internationally “legally binding” mitigation obligations (i.e., mandatory obligations that are binding under international law) and internationally “voluntary” emissions reduction commitments (those that are not binding under international law, but which may or may not be binding under domestic law). It is typically assumed that internationally legally binding commitments are necessarily superior to voluntary ones. But the legal form, notionally binding or otherwise, of international cooperation on mitigation is not an end itself. Rather, it is a means to what is ultimately important: namely, the *ambition* and *credibility* of countries’ mitigation contributions. Focusing on ensuring that mitigation contributions are internationally binding can affect the ambition and credibility of those contributions in important ways, both positively and negatively. These influences need to be understood if we are to build institutions of international cooperation that promote ambition and credibility to the extent required. And we must also ask whether there are international enforcement mechanisms that are really credible; we should recall, for example, that missing targets in one period under the Kyoto Protocol would, in principle, require that the shortage be made up in the next period. But there was nothing to stop Canada, for example, from withdrawing from the agreement as a whole.

Raising Ambition

By *ambition*, I mean the *scale* of a country’s intended contribution to the global mitigation effort. This is typically conceived in terms of the extent to which a country plans to limit or reduce its domestically produced greenhouse gas emissions. In a globalized world, it must be remembered that actions occurring in the territory of one country can strongly influence the level of emissions produced elsewhere. This is most obvious in regard to internationally traded goods (such as imported goods with embodied emissions, and fossil fuel exports) and transnational sectors (such as international shipping and aviation), but also includes a country’s low-carbon innovation efforts across the innovation chain (recognizing that innovation has beneficial global spillovers in terms of knowledge, technical options, and cost reductions) and the provision of

finance or technology for overseas mitigation. While there are pragmatic reasons for focusing primarily on domestically produced emissions, a full accounting of the ambition of a country's contribution would both take account of its economic, geographical, historical, and other circumstances and include its wider contributions to the overseas emissions, and emissions reduction efforts, over which it has influence.¹⁴ The same is true for assessing its actions "ex post"—see below on monitoring and reporting.

For a given collective goal (e.g., a 50–50 chance of staying below 2°C), the collective ambition of countries is what matters for the effectiveness of the mitigation effort. The aggregate of countries' current commitments and contributions, as shown earlier in this book, leaves the world well short of the pathway required to reach this goal even with only a 50–50 probability. We should look, therefore, for the international process to encourage countries toward major increases in country-level ambitions.

Focusing on making targets internationally legally binding, and subject to enforcement measures (however noncredible), can have the opposite effect of encouraging countries to *moderate* their ambition by making the lowest possible international commitment that they feel they can get away with, or that which they are very confident they can achieve.¹⁵ It is the old story of central planning: individual production units lobby for low targets so that they can be recognized for achieving them rather than being punished for failure.

If low-ambition commitments are long-lasting as well as being formalized in a legally binding treaty (as was the case for the Kyoto Protocol), such agreements can effectively lock in that low ambition for a long period of time. Modest ambition leaves the international community stuck with moderate action involving some costs, but few benefits in the form of mitigated climate risks and the opportunities that are likely to come from deep innovation toward a decarbonized world.

Focusing on legally binding commitments can also moderate collective ambition because it risks alienating some of the biggest players. China, India, and other major emerging economies have, for different reasons, been very hesitant to accept specific, internationally binding mitigation obligations. This arises in part because of perceived inequality, including in relation to historical emissions, and in part because of worries about ceding power to others who may not be fully trusted. And while perspectives are changing (and this was the subject of the New Climate Economy

report), there remain some concerns over the relation between growth and poverty reduction on the one hand and reduced emissions on the other. The US, moreover, is constrained (at least in the short run) by its Senate, which is highly unlikely to provide its consent for the executive to ratify a new international climate treaty (and certainly one that does not involve “binding obligations” on China), a consent that is required under the US Constitution. This political reality limits the nature and scope of international climate change arrangements in which the US can participate to either (i) an international agreement that is not legally binding (but which could nonetheless contain serious political commitments), like the Copenhagen Accord; or (ii) a hybrid agreement that blends and “updates” existing commitments made under the UNFCCC (which the US *has* ratified), with a separate, nonbinding instrument containing new elements, including the US’s (and other countries’) nationally determined emission reduction contributions.¹⁶

There is, therefore, a strong pragmatic impetus to refocus the negotiations away from a system in which each country has a fixed, long-term, internationally binding target toward one that allows countries to put forward contributions that are nonbinding internationally, but that promotes *increasingly high ambition* in countries’ contributions over time. One such mitigation framework under strong international discussion, and advocated in the New Climate Economy report, would involve countries setting 5–10-year rolling targets, to be reviewed every five years with the expectation that ambition will increase over time.¹⁷ The idea is that the 5-year targets would be unconditional and the 10-year targets would be indicative (and could perhaps be conditional). While this would form part of an international legal framework covering processes (i.e., with obligations to submit, update, and report on national commitments, etc.), *achieving* the targets themselves would not be mandatory and binding internationally. We turn shortly to credibility and national legal frameworks.

Another option is to enable and encourage countries to communicate internationally their contributions in the form of both long-term (or medium-term) targets and shorter-term policies and measures, with each subject to a “range” of possible outcomes, with the upper bound reflecting the most ambitious (yet achievable) outcome. The upper target would promote an examination of the specifics of how ambition could be ramped up. Both China and India offered ranges for targets for the

Cancún agreement, although these did not have any binding force. An advantage of an upper target is that it sets something to aim for in a way that having only a minimum target does not.

Building Credibility

By *credibility*, I mean the extent to which a country's commitments engender confidence that those commitments will be fulfilled.

Making commitments internationally legally binding (in the mandatory and enforceable sense) is neither necessary nor sufficient for credibility. The fact that international bindingness is not a guarantor of credibility is evinced most starkly by Canada's wanton disregard for its Kyoto Protocol obligations, and eventual withdrawal from the Protocol altogether. The lack of domestic political commitment to achieving the target, the lack of institutional and policy arrangements in place to achieve it, and, by contrast, the strong political orientation toward expansion of its emissions-intensive unconventional oil sector all undermined the credibility of Canada's commitment.

Conversely, commitments can be credible without being internationally binding. It is notable, for example, that the EU, the US, and China look close to delivering on their 2020 emissions reduction pledges made in Copenhagen, and formally adopted at COP 16 in Cancún, even though these are not internationally legally binding. The factors affecting judgments about what is credible need further development, and different parties will take different factors into account when reaching their views as to the credibility of others' commitments. At the very least, though, we can say that credibility is affected by (i) the nature, extent, and feasibility of a country's expressed commitments/contributions; (ii) the domestic institutions, laws, policies, and measures a country has in place to support and implement its commitments/contributions; and (iii) the country's track record in climate mitigation.¹⁸

Point (ii), on domestic arrangements, is particularly important, not least because credible domestic arrangements affect a country's investment climate (which we can think of as describing the features of a society that affect the confidence of firms to get things done and to be able to realize a return on their investments) and hence the riskiness, cost, and level of investment in the low-carbon economy.

At most, it could be said that if an agreement is internationally binding it can make a country's commitment, other things being equal, *more* credible. The fact that a commitment is internationally binding would typically increase the external incentives a country faces to achieve that commitment: they may face greater reputational damage or other political costs than if the commitment is voluntary; and if the commitment is subject to international compliance and enforcement measures then the threat of such measures, if in some way credible, may incentivize compliance. In those countries where treaty ratification imposes direct obligations within the country's domestic legal system, or where domestic institutions (e.g., the judiciary, the executive, or the parliament) are required by domestic constitutional or legal arrangements to implement or otherwise respond to international legal obligations, this may increase internal pressures and incentives to comply with commitments.

Overall, the credibility gained by making climate mitigation commitments "legally binding" is arguably only modest, especially when the enforcement mechanisms are likely to be weak, and, in my view, is outweighed by the undesirable effects on ambition discussed above. Credibility can be enhanced more effectively by a greater focus at the international level on the nature and quality of countries' domestic institutions and policies for cutting emissions. For example, countries could be expected (as part of their mitigation contributions) to communicate details about their domestic institutional, legal, and policy arrangements for achieving their contribution, and for reducing emissions more generally. A number of parties have suggested such an approach in the lead-up to the Paris meeting.¹⁹ The international agreement could go a step further, by containing a provision that obliges parties to implement their nationally determined contribution under domestic law, or to otherwise support their international contribution with domestic measures.²⁰ Such a focus on domestic arrangements could foster a deeper conversation between countries about what they are actually doing on the ground, and about the actions, opportunities, and barriers to decarbonization that each country is facing. This conversation, in turn, would be likely both to highlight opportunities for international collaboration and assistance and also to build trust and confidence among countries—both of which are discussed further below.

8.3 Building trust and confidence

Mutual trust and confidence are key ingredients for more ambitious national and international action. They are often lacking, and it is therefore important to examine how international processes can help engender trust and confidence among parties.

8.3.1 Placing the fight against poverty center stage

Many developing countries, for example India, as we saw in chapter 7, have worried about making commitments on emissions reductions for fear they might hinder growth and poverty reduction. I examine growth immediately below using the example of the work of the Global Commission on the Economy and Climate. The focus on poverty reduction is closely related but not the same. International collaboration should, as both a moral issue and a political matter, show that the fight against poverty is at center stage. As I have long argued (e.g., in chapter 2 of this book),²¹ the two defining challenges of our century are overcoming poverty and managing climate change. That recognition should be at the heart of international collaboration. There is a clear role for international institutions here, but this spirit should pervade international interactions between countries. I return to this in chapter 9 on equity, which discusses the idea of “equitable access to sustainable development.” Growth, development, and poverty reduction have been at the core of my research and writing on economics since the late 1960s and in my involvement for a decade as chief economist of the World Bank and of the European Bank for Reconstruction and Development.

8.3.2 Recognizing opportunities for better growth and stronger climate action

One of the major obstacles to climate action has been the perception that it could impede growth in both developed and developing countries. The Global Commission on the Economy and Climate has shown that much of what needs to be done over the next two decades to cut emissions comes from investments in transforming cities, land use, and energy that also bring strong returns in the form of growth, innovation, discovery, and co-benefits, including in health, environment, and energy security (see section 2.10). If we manage these investments and innovations well,

we will be in a much stronger position to tackle the challenges of continuing emissions reductions over this century than if we dither and try to pursue old and dirty ways.

It is critical that the opportunities and benefits associated with climate mitigation are well understood by officials and experts within international institutions, by government officials who negotiate on climate change (and on other issues), and by domestic officials, so that responses can be prudently designed to reap these rewards. This is beginning to happen. Increasingly the case is being made by businesses and by city mayors—for example, in the work of the commission itself, where businesspeople and mayors constituted nearly half of the commission, and in the strong emphasis on climate at fora such as the World Economic Forum in Davos and the World Business Council for Sustainable Development.

There is also an important international dimension to this growth story that stems from the way technological innovation, business investments, and social institutions evolve. Through international cooperation and the coordination of domestic policies and investments, countries can send stronger and clearer signals about the future direction of the global economy than they can when acting unilaterally. International cooperative action, domestic political action, business investments, social norms, and political trends interact with and reinforce one another, in the form of more innovation, bigger markets for low-carbon products, greater domestic policy action, and so on, which in turn help build the trust and confidence that make further international cooperation easier. An understanding of these cooperative dynamics and the associated potential will help unleash the global wave of innovation, discovery, and high-quality growth that this book has argued is eminently achievable.

8.3.3 Repeated interaction and early rewards

One institutional strategy to foster international trust and cooperation where they are lacking is to start with smaller commitments or those that bring early domestic rewards and combine them with monitoring and verification mechanisms.²² Monitoring, information, feedback, and verification are helpful in showing countries that their counterparts are implementing their commitments. Achieving commitments builds mutual trust and gives countries the confidence to undertake deeper

commitments, including riskier and costlier ones. Regular interactions provide frequent opportunities for information sharing and verification, and make it easier to escalate commitments.

In the international climate negotiations, this kind of interaction has been largely lacking. Setting emissions reduction targets for the medium or longer term is a valuable part of the process, but the need to build trust and confidence along the way means that shorter-term commitments and contributions—such as commitments to implement policies and measures, to undertake investments, to achieve intermediate targets such as sectoral emissions reductions, and so on—will also be important. One way to do this would be to establish an agreed cycle by which countries review and upgrade their commitments (e.g., every five years), as discussed above. Another option would be for countries to agree to introduce and progressively increase the ambition of particular types of policies and measures. For example, some countries could agree among themselves to implement and raise over time, according to an agreed schedule, the levels of explicit (or implicit) carbon prices on certain sectors of their economy,²³ or to phase out coal-fired generation capacity in explicitly timed stages, or to deploy renewable energy capacity in a staged and coordinated way.

Moreover, there are a number of areas that offer early rewards: significant emissions reductions at low (or negative) cost that can be implemented quickly. A 2013 report by the International Energy Agency discussed four categories of policy measures that can be implemented by 2020, at no net economic cost: progress and acceleration on energy efficiency measures; measures to prevent new coal-fired plants and limit the use of the least efficient ones; measures to reduce the release of methane from upstream oil and gas production; and accelerating the reduction in fossil fuel subsidies.²⁴ If implemented, the IEA calculates that these four measures would reduce annual GHG emissions by 3.1 billion tonnes of CO₂e in 2020, relative to levels otherwise expected. The IEA report argues that this reduction represents 80% of those required for a 2°C path in 2020. Of the four, energy efficiency could contribute 1.5 billion tonnes (which would involve the strong policies for buildings, industry, and transport mentioned in chapters 2 and 3); prohibiting subcritical coal-fired plants and limiting the least efficient could reduce emissions by 640 million tonnes (and reduce air pollution);²⁵ reducing

methane release from venting and flaring in oil and gas production could contribute another 300 and 280 million tonnes respectively; and a partial phasing out of fossil fuel subsidies could save another 360 million tonnes.²⁶

There are other relatively low-cost options that would have considerable co-benefits, e.g., for public health, poverty reduction, biodiversity protection, and/or natural capital enhancement. One such area relates to short-lived pollutants, including soot, methane, and some hydrofluorocarbons (HFCs). The international Climate and Clean Air Coalition, a group of developed and developing countries, is focused on taking practical steps to reduce such pollutants through, for example, the provision of clean cooking stoves to poor households and measures to promote cleaner fuels.²⁷ Such initiatives have considerable benefits in terms of better public health and poverty reduction as well as climate benefits and can help to build confidence within developing countries in particular.

Restoring degraded forests also has great potential. A rough estimate would indicate that there are around 2 billion hectares of degraded forests around the world, around half of all forest cover. The Global Commission on the Economy and Climate found that initiating restoration of at least 350 million hectares by 2030 could generate \$170 billion per year in net benefits from watershed protection, improved crop yields, and forest products, and would sequester about 1–3 billion tonnes of CO₂e per year, depending on the areas restored.²⁸

8.3.4 Transparency, measurement, examples

International institutions can be particularly effective and useful in gathering, standardizing, and disseminating information, evidence, and examples, and in developing technical standards and processes in novel areas (e.g., carbon accounting, measuring, reporting, and verifying of emissions inventories, etc.). As part of a movement toward an international climate governance framework that is focused more on countries' domestic policies, measures, and institutions, and on facilitating a structural transformation toward sectoral decarbonization, it would be advantageous to develop greater institutional capacity to monitor and report, in a standardized way, on the mitigation actions that countries are taking, the policy mechanisms through which they are doing so, and the

effectiveness, efficiency, and distributional impacts of those interventions. Efforts are already under way under the UNFCCC and elsewhere to develop standards and practices in these areas. Greater transparency regarding international carbon flows (e.g., emissions embodied in imports and exports, and their producers and consumers) would help build global understanding not just about where emissions are produced, but also about where emissions-intensive goods are consumed. This would help to provide a more nuanced picture of who is influencing, and responsible for, emissions in a globalized world. In my view calculations that describe country emissions on a production basis and on a consumption basis are both relevant. The former is relevant because production determines income which determines expenditure. The latter is relevant because consumption decisions determine demand for production. As usual in economics there are two-way processes.

The metrics pioneered by the C40 cities network are good examples of the kind of information that would be very useful in this regard. The network uses a large survey of city mayors to identify the *powers* and *degree of control* that mayors and city governments have (over *assets*, such as buses and housing stock, and over *functions* such as economic development); the *actions* cities are taking (it groups these actions into clusters, which it calls *interventions*); the *levers* they are using to take those actions (e.g., regulation, procurement, projects, etc.); and the *geographical scale* and *implementation status* of those actions.²⁹ City collaboration on measurement and analysis in this way could lead directly to action. For example, cities could agree common standards for bidding for contracts such as bus supply, and this could lead to greater clarity for bidders and substantial economies of scale.

This kind of information can serve a number of useful purposes: it can provide the evidential basis for countries to understand what others are doing and hence foster the development of mutual trust and confidence that can lead to greater ambition; aggregated and standardized information can enable trends to be analyzed, good practices to be identified (which countries can draw on in designing their own policies), and future priorities to be developed; and it can give countries ideas and inspiration about the measures they can take. With regard to the last of these, the development and diffusion of case studies and examples can be particularly helpful—for example, to politicians, businesses, and civil

society representatives who are seeking to persuade their compatriots about what is possible and about the benefits of well-designed climate actions.

8.3.5 Beyond environment ministers

The examples shown here, and in the next section, demonstrate that collaboration and exchange of ideas should go far beyond the environment ministers and foreign ministers usually involved in international negotiations. In particular, economics and finance ministers and their departments are of great importance. That is where much national decision-making occurs. And it is in these places that understanding about economic growth and climate responsibility being potentially mutually supportive must be deepened. That is why two-thirds of the membership of the Global Commission on the Economy and Climate was drawn either from business people in very senior positions or from former economics ministers, prime ministers, and presidents.

8.4 Collaboration on finance, technology, and innovation

International cooperation can play an important role in fostering the availability of financial capital to undertake investments in, for example, low-carbon energy and urban infrastructure, improved agricultural and land use systems, and so on, and in ensuring that innovation—technological and otherwise—occurs at the necessary scale and speed.

Chapter 3 discussed the role of specialized public financial institutions like state development banks and green investment banks in mobilizing finance for low-carbon development. The international financial institutions also have an important role to play in low-carbon finance, both in facilitating flows of climate-related finance (including transfers) for mitigation and adaptation from rich to poor countries, and in providing the technical assistance needed to build countries' capacities to attract, manage, and invest effectively both private and public climate finance. At the same time we should recognize that the great majority of saving now arises outside the rich countries. For example, China now saves more than the US and the EU put together. And many technological advances occur outside rich countries. The flows of funds will be multi-directional. The examples of new funds and development banks focused

principally on bringing saving and productive investment together are mounting—for example the Asian Infrastructure Investment Bank and the BRICS-led development bank (where I was involved in developing the plan).

These international financial institutions have key features which make them immensely valuable as promoters of and partners for the private sector. In addition, of course, they are able to contribute to the funding of public-sector infrastructure. There are five key advantages that such institutions can bring (state development banks or green investment banks have similar advantages: see section 3.1.5). First, they can have a full range of instruments, from loans to equity to political risk guarantees, which would not normally be available to a single private institution. Second, they have ownership structures that allow them to take a long-term view. Third, their presence itself in a transaction reduces risk because government-induced risks may be less if they are involved. Fourth, they can build strong sector expertise, as the EBRD has done, for example, in energy efficiency. Fifth, they should be much more trusted as conveners of financiers, for example in deal syndications, than one particular private bank which might be suspected of pursuing narrow self-interest. These are powerful institutional advantages from a sound institutional design. Together they point to a very strong role for such institutions in accelerating the transition to a low-carbon economy.

International cooperation—both coordination of domestic measures and deeper forms of collaboration—also has an important role to play in innovation, particularly regarding low- and zero-carbon energy technologies. The transition would be faster the more quickly clean energy becomes cheaper than fossil fuels, even without a subsidy, a carbon price, or charging for the air pollution that arises from fossil fuels. Renewables are already cheaper than fossil fuels in many locations,³⁰ and strong innovation can make them cheaper in many more very soon. Advances in energy storage would accelerate that process still further. This requires concerted policies and financing across the innovation chain, from basic and applied research, through development and demonstration, to deployment support.

Meeting this challenge demands major investments and the focused attention of the world's brightest scientists and engineers. However, at present there is a major shortfall in the research and development (and demonstration) of clean energy technologies in both the public and

private sector. Public energy R&D in IEA member states was around \$12 billion in 2012³¹—less than half what it was in real terms in the late 1970s.³² Were we able to add in non-IEA members, worldwide energy R&D might be of the order of \$20 billion per year. Worldwide, publicly funded research, development, and demonstration for renewable energy is only about \$4 billion a year.³³ This is not an area where the data allow us to be precise, but the general conclusion is clear: given the challenges we face, on climate change, energy insecurity, energy poverty, and air pollution, investments in energy R&D (and demonstration)—especially for renewable energy—are far too low.

Private-sector R&D spending in the energy sector is also low—especially relative to other, innovation-focused industries, and given the scale of the energy-sector decarbonization required to manage climate change effectively. Private energy companies typically spend an amount equal to about 2% of sales on R&D, compared with 5% in consumer electronics and 15% in pharmaceuticals and biotech.³⁴

Because of this shortfall, the world would benefit greatly from a major expansion in programs of publicly funded R&D in energy. The Global Commission on the Economy and Climate recommended that it be at least tripled, to reach at least \$100 billion per year globally. One example of how R&D in renewable energy could be scaled up is through a recently proposed “new Apollo Program,” of which I am a coauthor.³⁵ This could be coordinated at the international level but operate in a decentralized way within individual participating countries. The program could focus on the following areas: electricity from solar and wind, with a particularly strong focus on solar photovoltaics and concentrated solar power; electricity storage; smart grids and grid integration of renewable and other energy sources; and hydrogen for storage and transport. It could involve research, development, and demonstration and not be narrowly confined to basic R&D. Participation in the program should be open to all governments, and it could incorporate the following basic features:

1. **Scale.** Any member government in the program would pledge to spend an average of 0.02% of GDP per year as public expenditure on the program from 2015 to 2025. The money would be spent according to the country’s own discretion; it could be an enhanced, expanded, and international version of many national programs.

2. Roadmap. The program requires a clear roadmap of the scientific breakthroughs required at each stage to maintain the pace of cost reduction, along the lines of Moore's Law. Such an arrangement has worked extremely well in the semiconductor field, where since the 1980s the Semi-Conductor Roadmap has spelled out the advances needed at the precompetitive stages of R&D. That roadmap has been constructed through a consortium of major players in the industry in many countries, and the R&D needed has then been financed by governments and the private sector. This program would adopt a similar arrangement.
3. Target. The target should be that new-build renewable energy becomes cheaper than new-build coal in relatively sunny parts of the world by 2020, and in all parts of the world by 2025. The program would also adopt its own target for the scale of energy production for renewables by 2025 and 2030.

My coauthors and I urged heads of government to agree on the Apollo Program by the 2015 Paris COP. The program could begin immediately after that, spanning 2016–2025. This is just one example, albeit an important one, of the kind of coordinated international program on a scale that could produce fast and strong results. It is set out in a little detail, not as something that would dominate or exhaust collaboration on R&D, but as a strong and specific example of how purposeful collaboration could take place.

In addition to R&D and demonstration, it will also be important for countries to provide deployment support for new technologies—that is, policies that grow demand, and hence scale—to drive down their cost. One example of a policy to do this, which was very influential in driving down the costs of solar PV, is well-designed feed-in tariffs for the electricity sector. Regulatory standards in the transport sector, such as those on fuel consumption and emissions, have produced powerful results. Similarly in domestic appliances, lighting, and buildings. Suitably high and predictable carbon prices will also support the desired deployment through their incentive effects and through providing revenues to support the required public investments. Beyond R&D, scale and learning-by-doing are very powerful in driving down costs.

There is an important role for international coordination here, too. Currently, deployment support policies are entirely nationally driven. Yet

all countries have an interest in the learning-by-doing benefits of these policies and the associated price declines in the critical technologies discussed here.³⁶ In line with the “technology roadmap” approach to R&D and to demonstration, in the example articulated above, countries ought to think strategically about the sort of cost reductions they wish to target through deployment support, and in which countries it makes most sense to support which technologies, then coordinate national support programs on that basis. We have already proposed the example of coordinated specification for bidding processes, such as for buses, across major cities. This does not mean a rigid program for “picking winners,” but it does mean being aware of possibilities and of appropriate timing for support and for new ideas.

The technology cost reductions targeted through the innovation policy coordination advocated here would help enormously to overcome some of the key constraints that hold back countries’ ambition—technology options, and relative prices of clean energy and fossil fuels. Taken together, policies for R&D, demonstration, and deployment, and support along the innovation chain more generally, could unlock yet more ambitious climate action. They should be an integral part of the framework discussed here for fostering ever-higher ambition.

While the energy innovation challenge is particularly urgent and important, tackling climate change would benefit from more intense international cooperation on innovation across all relevant emissions-intensive sectors. In line with the need to build trust and confidence as discussed above, and with the approach to international equity discussed in chapter 9, it will be especially important for high-income countries to engage in collaborative innovation efforts with developing countries that focus on the development and adaptation of low-carbon technologies that meet the latter’s needs. The challenge of overcoming poverty should command our attention as a matter of morality, and it is in developing and emerging-market countries that the large majority of investment in the next two or three decades will occur.

A model for public-private and international innovation collaboration is the Consultative Group on International Agricultural Research (CGIAR),³⁷ a \$1-billion-a-year global agricultural research partnership focused on agricultural innovation in tropical food crops. CGIAR involves 15 research institutes across the developing world and brings

together high-level scientific capacity, significant funding, and institutional memory on developing-country agriculture and natural resource management, enabling them to provide farmers with vital science and technology support.³⁸ Similar institutions could be developed to foster innovation in, for example, renewable energy and building materials applications suited to diverse conditions in developing countries, including off-grid electricity, household thermal energy, and microgrid applications.³⁹

8.5 A brief comment on Paris

The 2015 Paris COP provides an important opportunity to make strong progress in tackling climate change. Major conferences can have the effect of increasing public pressure on politicians to raise the ambition of their commitments and contributions, particularly on mitigation. This pressure stems from the involvement of heads of government. This time around, in contrast to the Copenhagen COP in 2009, heads of government have been involved much earlier in the process, including, for example, in the UN Secretary-General's Climate Summit in New York in September 2013. The pressure also comes from activist groups, which attend the major conferences in large numbers. As I discuss further in the concluding chapter of this book, such social pressures can have powerful positive impacts on policy—as, for example, in the Make Poverty History campaign and the G8 summit in Gleneagles in 2005.⁴⁰ They can also have negative impacts on the potential for agreement, as they did, for example, in the Seattle World Trade Organization protests in 1999.

This book has not sought to set out the details of an international agreement. Rather, it provides an examination of the nature and scale of actions required, and the principles, policies, and directions to get there. In this spirit, let me offer some criteria for success in Paris:

- Recognition of the scale of the challenge and setting an appropriate shared goal of net zero global emissions within the second half of this century, which relates to, recognizes the consequences of, and confirms the 2°C target agreed at COP 16 in Cancún 2010, as discussed earlier in this chapter;

- Recognition of the opportunities for growth, poverty reduction, and beneficial structural change associated with strong action to reduce emissions, and the advantages in confronting all these challenges simultaneously, and with a collaborative spirit across countries;
- Ambitious and credible contributions to emissions reductions by individual countries;
- Mechanisms to ensure regular interaction among countries and encourage the raising of contributions over time;
- Sector-specific collaborations and commitments in areas such as decarbonizing electricity (especially through reducing coal and scaling up clean energy innovation) and reducing emissions from deforestation and forest degradation (REDD+)—these could be advanced in or around Paris, either within or outside the formal UNFCCC process;
- A shared recognition of the importance of equity in underpinning the long-term mitigation effort, consistent with the notion of “equitable access to sustainable development” as specified in chapter 9, involving all countries making the transition to a decarbonized economy, with developed countries making earlier deep cuts and providing strong examples and strong assistance in finance, technology, innovation, and know-how to developing countries.

If managed well and if key countries rise to the occasion, the conference could produce results that spur stronger domestic action by governments, investors, and citizens, in turn improving the technological, economic, social, and political conditions in which future climate action will occur. This would in turn make it easier for countries to raise their ambition as time goes on, and to strengthen international agreements in future. In other words, Paris could play an important role in fostering the constructive interplay and mutual reinforcement between international cooperation on the one hand and action within countries by governments, cities, businesses, and citizens on the other.

8.6 Leadership from big countries

There is a particularly important role to be played by the US, China, and Europe—the three largest emitters, whose combined emissions are around half of the global total.⁴¹ Their leadership in action, mutual support and

collaboration, and support for and collaboration with other countries, will in large measure determine whether the world manages climate change successfully. What they do in the next two decades is of fundamental importance in shaping this century and the future of our climate.

In the short term the chance for a strong agreement in Paris would be improved significantly if they could find a way to provide strong leadership, particularly by setting examples with ambitious domestic commitments and contributions. There have been some encouraging signs in this direction already, as discussed in chapter 7, but greater ambition and leadership are needed. Both President Obama and President Xi understand this problem well. Both see this, and they are surely right to do so, as a key part of their legacies. Of these three great parts of the world, Europe was in the vanguard in putting climate change on the international agenda. And Europe has confirmed, in October 2014, its target of 40% reductions by 2030 relative to 1990. Paris 2015 could surely be a moment to demonstrate leadership and collaboration.

The US and China have been cooperating especially closely on climate change in the two years leading up to Paris, particularly in the bilateral Climate Change Working Group, established during Secretary of State Kerry's first trip to Beijing in April 2013. The two countries are working together on practical projects across a number of energy- and emissions-intensive sectors and are increasingly coordinating on policy, as exemplified by the agreement by Presidents Obama and Xi in 2013 to phase down the production and consumption of hydrofluorocarbons from refrigeration and air conditioning, and by their ongoing bilateral discussions regarding their national contributions under a Paris agreement. Their joint announcement of emissions targets for the US and China in Beijing on 12 November 2014 was an important event. It embodied the collaborative spirit and shared commitment by making their contributions known several months before the expected period around the first quarter of 2015. The US committed to cuts of 26–28% below 2005 levels by 2025, and China to peak emissions around 2030 or earlier. And there was promising detail on technical collaboration, the 2°C target, and the opportunities for combining growth and climate responsibility.

Europe has historically been a strong leader on climate change, and the world continues to look to Europe for strong leadership in emission reductions and technology and financial support. Europe's climate

ambitions have been strong in part thanks to Angela Merkel's leadership of the G8 and EU presidency in 2007. With Germany again taking the presidency of the G7 in 2015, and with France hosting the Paris summit, the leaders of these two nations will shoulder particularly weighty responsibilities to show leadership within and through the EU. The European Council's commitment to 40% reductions, 1990–2030, in domestic emissions was an important reconfirmation of Europe's sense of purpose and leadership.

For the longer term the world will rely heavily on the technology and economic strength of these countries. Now, as we move toward Paris in 2015, is the moment for them to chart a path of collaboration, climate responsibility, and prosperity for the coming decades. The last few months of 2014 have looked increasingly promising.

8.7 Conclusions

In summary, the lessons we have learned from this chapter are:

- More effective international cooperation on climate change can increase climate action within countries, and vice versa. Activities at these two levels can be mutually reinforcing.
- The framework for international climate governance must be consciously built to foster this mutually reinforcing interplay between international cooperation and domestic action. This requires sensitivity to the domestic and international factors that affect decisions relating to climate change.
- Both national commitments and international agreement can be greatly enhanced by the recognition that strong and better-quality growth, poverty reduction, and climate responsibility can indeed be effectively combined to tackle the two defining challenges of our century: managing climate change and overcoming world poverty.
- An effective framework for climate governance would include: a clear and compelling shared goal, based on the 2°C target, expressed in terms of reducing global annual emissions to zero within the second half of this century; measures to encourage credible and ambitious contributions toward meeting that goal; the institutional means to foster increasing ambition, credibility, trust, and confidence over time; and strong

international coordination and collaboration on finance, technology, and innovation.

- International cooperation on climate change must also be equitable, for both moral and pragmatic reasons. Chapter 9 goes into greater detail on the principles in relation to equity on which international climate cooperation should be based.
- The Paris climate conference in 2015 provides an important opportunity to establish an effective and equitable climate governance framework that lasts for the long term, has flexibility for learning and ramping up of ambition, and can build the confidence to foster the investment and innovation that will drive the transition to the low-carbon economy.
- Leadership by the US, EU, and China—together responsible for around half of global emissions—will be crucial on the road to, and beyond, Paris. Bilateral cooperation between the US and China is already building valuable political momentum, sending a strong signal that the two largest emitters are serious about a low-carbon transition. The EU has recently confirmed strong targets for 2030 and could and should resume the leadership it has shown in the past.

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